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- 1** Comparison of access methods for time-evolving data 80%

Betty Salzberg , Vassilis J. Tsotras  
**ACM Computing Surveys (CSUR)** June 1999  
 Volume 31 Issue 2  
 This paper compares different indexing techniques proposed for supporting efficient access to temporal data. The comparison is based on a collection of important performance criteria, including the space consumed, update processing, and query time for representative queries. The comparison is based on worst-case analysis, hence no assumptions on data distribution or query frequencies are made. When a number of methods have the same asymptotic worst-case behavior, features in the methods tha ...
- 2** Temporal sequence learning and data reduction for anomaly detection 80%

Terran Lane , Carla E. Brodley  
**ACM Transactions on Information and System Security (TISSEC)** August 1999  
 Volume 2 Issue 3  
 The anomaly-detection problem can be formulated as one of learning to characterize the behaviors of an individual, system, or network in terms of temporal sequences of discrete data. We present an approach on the basis of instance-based learning (IBL) techniques. To cast the anomaly-detection task in an IBL framework, we employ an approach that transforms temporal sequences of discrete, unordered observations into a metric space via a similarity measure that encodes intra-attribute depende ...
- 3** Characterization: Source-level IP packet bursts: causes and effects 77%

Hao Jiang , Constantinos Dovrolis  
**Proceedings of the conference on Internet measurement conference** October 2003  
 By source-level IP packet burst, we mean several IP packets sent back-to-back from the source of a flow. We first identify several causes of source-level bursts, including TCP's slow start, idle restart, window advancement after loss recovery, and segmentation of application messages into multiple UDP packets. We then show that the presence of packet bursts in individual flows can have a major impact on

aggregate traffic. In particular, such bursts create scaling in a range of timescales which c ...

#### 4 Data streams II: Clustering of streaming time series is meaningless 77%



Jessica Lin , Eamonn Keogh , Wagner Truppel

**Proceedings of the 8th ACM SIGMOD workshop on Research issues in data mining and knowledge discovery** June 2003

Time series data is perhaps the most frequently encountered type of data examined by the data mining community. Clustering is perhaps the most frequently used data mining algorithm, being useful in it's own right as an exploratory technique, and also as a subroutine in more complex data mining algorithms such as rule discovery, indexing, summarization, anomaly detection, and classification. Given these two facts, it is hardly surprising that time series clustering has attracted much attention. T ...

#### 5 Compression Domain Rendering of Time-Resolved Volume Data 77%



Ruediger Westermann

**Proceedings of the 6th conference on Visualization '95** October 1995

An important challenge in the visualization of three dimensional volume data is the efficient processing and rendering of time-resolved sequences. Only the use of compression techniques, which allow the reconstruction of the original domain from the compressed one locally, makes it possible to evaluate these sequences in their entirety. In the following paper a new approach for the extraction and visualization of so called time-features from within time-resolved volume data will be presented. Ba ...

#### 6 Visualization: Chronovolumes: a direct rendering technique for 77%



visualizing time-varying data

Jonathan Woodring , Han-Wei Shen

**Proceedings of the 2003 Eurographics/IEEE TVCG Workshop on Volume graphics** July 2003

We present a new method for displaying time varying volumetric data. The core of the algorithm is an integration through time producing a single view volume that captures the essence of multiple time steps in a sequence. The resulting view volume then can be viewed with traditional raycasting techniques. With different time integration functions, we can generate several kinds of resulting chronovolumes, which illustrate differing types of time varying features to the user. By utilizing graphics ...

#### 7 Locally adaptive dimensionality reduction for indexing large time series 77%



databases

Kaushik Chakrabarti , Eamonn Keogh , Sharad Mehrotra , Michael Pazzani

**ACM Transactions on Database Systems (TODS)** June 2002

Volume 27 Issue 2

Similarity search in large time series databases has attracted much research interest recently. It is a difficult problem because of the typically high dimensionality of the data. The most promising solutions involve performing dimensionality reduction on the data, then indexing the reduced data with a multidimensional index structure. Many dimensionality reduction techniques have been proposed, including Singular Value Decomposition (SVD), the Discrete Fourier transform (DFT), and the Discrete ...

#### 8 Development of processors and communication networks for embedded 77%

#### systems: Traffic analysis for on-chip networks design of multimedia applications

Girish Varatkar , Radu Marculescu

**Proceedings of the 39th conference on Design automation** June 2002

The objective of this paper is to introduce self-similarity as a fundamental property exhibited by the bursty traffic between on-chip modules in typical MPEG-2 video applications. Statistical tests performed on relevant traces extracted from common video clips establish unequivocally the existence of self-similarity in video traffic.

Using a generic communication architecture, we also discuss the implications of our findings on on-chip buffer space allocation and present quantitative evaluations ...

#### 9 Demonstrations: A dynamic query interface for finding patterns in time series data 77%

Harry Hochheiser , Ben Shneiderman

**CHI '02 extended abstracts on Human factors in computer systems** April 2002

Identification of patterns in time series data sets is a task that arises in a wide variety of application domains. This demonstration presents the timebox model of rectangular regions that specify constraints for dynamic queries over time series data sets, and the TimeSearcher application, which uses timeboxes as the basis of an interactive query tool.


#### 10 Multimedia Processing: Supporting audiovisual query using dynamic programming 77%

Milind R. Naphade , Roy Wang , Thomas S. Huang

**Proceedings of the ninth ACM international conference on Multimedia** October 2001

A necessary capability for content-based retrieval is to support the paradigm of query by example. Most systems for video retrieval support queries using image sequences only. We present an algorithm for matching multimodal (audio-visual) patterns for the purpose of content-based video retrieval. The novel ability of our approach to use the information content in multiple media coupled with a strong emphasis on temporal similarity differentiates it from the state-of-the-art in content-based retr ...

#### 11 Spatio-temporal visualization of urban crimes on a GIS grid 77%


 Suresh K. Lodha , Arvind K. Verma

**Proceedings of the eighth ACM international symposium on Advances in geographic information systems** November 2000

We present several techniques for visualizing the temporal dimension of a Geographic Information System. Techniques include (i) pseudo-colored time-window display, (ii) side-by-side height bars, (iii) stacked time-aggregated cumulative bars, (iv) stacked order-preserving bus, (v) vertical time dimension, and (vi) multi-layered display.

These techniques are presented in the context of an urban crime mapping application and extend the existing visualization techniques employed in this field. We ...

#### 12 Time series similarity measures (tutorial PM-2) 77%

 Dimitrios Gunopulos , Gautam Das

**Tutorial notes of the sixth ACM SIGKDD international conference on Knowledge discovery and data mining** August 2000

#### 13 ARMA models of program behaviour 77%



Ilkka Haikala

**ACM SIGMETRICS Performance Evaluation Review , Proceedings of the 1986 ACM SIGMETRICS joint international conference on Computer performance modelling, measurement and evaluation** May 1986

Volume 14 Issue 1

In models of virtual memory computer systems, it is generally assumed that the time intervals between the page (or segment) faults, often called lifetimes, are independent from each other. Due to the phase-transition behaviour in many real programs this is not always true, and strong correlations may exist between successive lifetimes. These correlations may have a notable effect on the system behaviour. This paper describes a series of experiments where autoregressive - moving average (ARMA ...

#### 14 Scalable algorithms for mining large databases

77%



Rajeev Rastogi , Kyuseok Shim

**Tutorial notes of the fifth ACM SIGKDD international conference on Knowledge discovery and data mining** August 1999

#### 15 Issues in satellite personal communication systems

77%



Erich Lutz

**Wireless Networks** February 1998

Volume 4 Issue 2

In the paper various issues in personal satellite communications are addressed. Basic geostationary and non-geostationary satellite constellations are considered. The narrowband and wideband characterization of the mobile satellite channel and related system implications are discussed. Satellite diversity is presented as a measure to overcome signal shadowing. The capacity of TDMA and CDMA multiple access is estimated, taking into account co-channel interference. Various network issues, suc ...

#### 16 VisFiles: presentation techniques for time-series data

77%



T. Todd Elvins

**ACM SIGGRAPH Computer Graphics** May 1997

Volume 31 Issue 2

This is the first in a series of columns on the subject of data visualization. I'm excited to have this opportunity because it will give me an excuse to finally learn about some subjects that I've wanted to learn about but never gave myself the time. Gordon Cameron, *Computer Graphics* Editor, has given me some latitude on topics so future visualization columns will deal with color selection, data visualization systems and APIs, data visualization research, information visualization, user i ...

#### 17 Model-driven hypermedia access to weather information

77%



Stephan Kerpedjiev

**Proceedings of the second international conference on Information and knowledge management** December 1993

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 ... array \*/ long eptime[nt][2]; /\* hold **time axis** array \*/ float ... &quot;TIME&quot;  
 for \* **time series** data type ... it on the graph as a **label** \*/ /\* \* WRITE OUT ...  
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 ... hold **time axis** array #endif real field(nx,ny,nz,nt ... **time series** data type,  
 &quot;TRACK  
 for track data type and & ... and write it on the graph as a **label** c c c ...  
 www.pmel.noaa.gov/epic/eps-examples/ programs/fortran/four\_d\_eps.F - 9k - [Cached](#) - [Similar](#)  
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#### lcurve (3 Series)

... 1 **time series** when lcurve is run with three **time series** PLT> info Scales: Grp Wind  
**Label** XData Min XData Max ... the min and max value of the **time axis** PLT> pv PLT ...  
 ledas-www.star.le.ac.uk/lheasoft/ xanadu/xronos/examples/lc3.html - 16k - [Cached](#) - [Similar](#) [pages](#)

#### ChartFactory

... timeAxisLabel - a **label** for the **time axis**. valueAxisLabel - a **label** for the value  
 axis. data - the dataset for the chart. ... Returns: a **time series** chart. ...  
 jpivot.sourceforge.net/api/com/tonbeller/ jpivot/chart/ChartFactory.html - 35k - [Cached](#) - [Similar](#) [pages](#)

#### <html> <head> </head><body><pre>Release Date Details 2.0.0.

... output files \* Corrected Residuals **label** in Phase ... 00 BUG FIXES \* Corrected **time series**  
 plotting error ... non-integer seconds corrected \* **Time axis** labelling bug ...  
 www.nottingham.ac.uk/iessg/gringo/DP4\_HIST.TXT - 8k - [Cached](#) - [Similar](#) [pages](#)

#### [PDF] Iterative Deepening Dynamic Time Warping for Time Series

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... only handles global scaling of the **time axis**, and not ... clustering the subsequences  
 of a **time series** using K ... approximation thereof), then assigning a **label** to the ...  
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#### [PDF] Time Series Abstraction Methods – A Survey

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... considered as an inductively derived **label** for a ... window) and (b) the distance between  
 between **time series**. ... locally shrink and stretch the **time axis** such that a ...  
 public.rz.fh-wolfenbuettel.de/~hoeppnef/ paper/Hoeppner-GIWS-2002.pdf - [Similar](#) [pages](#)

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... Consider the predator-prey **time series** relationship drawn below. ... species will be present  
 at point "A" as shown on the **time axis**? BE SURE to **label** your axes ...  
 web.utk.edu/~jdrake/EEB470/pages/ Aquatic\_Ecology\_exam\_2\_2003.pdf - [Similar](#) [pages](#)

poj Introductory StatisticsFile Format: Microsoft Word 2000 - [View as HTML](#)... SPSS has a **time-series** charting facility. <graph><sequence>. Enter the number attending as the outcome and **label** for show as the **Time Axis label**. ...stats.lse.ac.uk/chalmers/ST201wks/ST201Workshop8.doc - [Similar pages](#)

&lt;html&gt; &lt;head&gt; &lt;/head&gt;&lt;body&gt;&lt;pre&gt;&amp;lt;html&amp;gt; &amp;lt;head&amp;gt; &amp;lt;/ ...

... SOHO - CDS ; ; Name : UTPLOT ; ; Purpose : To plot **time series** data with ... 0) !y.gridstyle=vcheck (ygridstyle,!y.gridstyle); ; create a **time axis label** if none ...lasco-www.nrl.navy.mil/cds/util/graphics/utplot.pro - 10k - [Cached](#) - [Similar pages](#)

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# R-beta: time series structures

Paul Gilbert ([pgilbert@bank-banque-canada.ca](mailto:pgilbert@bank-banque-canada.ca))

Thu, 23 Oct 1997 10:37:00 -0400

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Message-Id: <97Oct23.104203edt.26518@mailgate.bank-banque-canada.ca>

Date: Thu, 23 Oct 1997 10:37:00 -0400

From: Paul Gilbert <[pgilbert@bank-banque-canada.ca](mailto:pgilbert@bank-banque-canada.ca)>

To: [plummer@iarc.fr](mailto:plummer@iarc.fr)

Subject: R-beta: time series structures

>represented. They are now R "objects" similar to S-PLUS "rts"  
>time series, but they are 3-dimensional arrays (iterations x variables  
>x chains). This seems like the best choice of data structure to me  
>but if someone else has thought more deeply about this tell me now  
>before I rewrite all my code!

Martyn

A couple of years ago I wrote a kernel of routines for handling the time dimension of objects. In part this was prompted by StatSci's introduction of rts, etc., which caused a number of problems in my code, at least if I wanted to take advantage of these new time representation. The idea of this kernel is that it allows me to use different representations without having to change much. I just have to add a few methods to deal with the new time representation.

If time is an important aspect of your objects you might want to look at this code. It is somewhat experimental, but it has worked very well for me with my fairly large library of routines for time series analysis. Attached below is some more explanation. Let me know if you want the code.

Paul Gilbert

## Description

Generic methods for handling time.

## Details

*tframe* objects implement a scheme for using classes and methods to handle different time representations in S. This provides a method by which code can be developed without too much dependence on the representation of time. For example, many time series programs only use the fact that data is arranged sequentially. On the other hand, putting



- the time axis label on a plot will require a method which is specific to the time representation.

While the primary purpose of this class and its methods is to allow code to be more robust with respect to other (and future) improved/different representations of time, the methods also provide a simple way to fix some inconsistency which may occur with the current mix of possible time representations.

The classes and methods associated with the implementation of `rts`, `cts` and `its` in `Spplus` accomplish some of these objectives. The attempt here is further separate the time representation from the data to allow a statement like

```
tframe(x) <- tframe(y)
```

to make the time frame of `x` the same as that of `y`, without the need to worry about what time representation is used in `y` (eg. `tsp`, `rts`, `cts`, `its`, ...). In this assignment `x` and `y` need not be too similar (eg - one might be a univariate series while the other is a matrix or an array or list of spatial or panel time series data), as long as they are similar in the time dimension.

This is accomplished by assigning an attribute of the data called `"tframe"` and giving that attribute a class so that methods can be applied to it. Doing this in a generic way allows for the possibility of future classes of time representation. This is different from the way that `rts`, `cts` and `its` are implemented, in the sense that it is the `tframe` attribute of the data which is assigned a class indicating the time representation, not the data object itself.

The most general (last) class of the `"tframe"` attribute should be `"tframe"`.

The method `"is.tframe"` checks if an object is of class `tframe`, and the method `"is.tframed"` checks if an object has an attribute `"tframe"` of

class `tframe`. In general, `tframe` methods act on the time frame (`tframe`) and `tframed` methods act on data which is `tframed`.

More specific methods can be defined for any special time representation (eg. below methods are defined for `tframes` of class `c("tsp", "tframe")` which are the old style `tsp` convention for time). Also, below, is an untested sketch of an implementation for `rts`, `cts`, `its` and a class and methods style implementation of `tsp` called `ts`.

See the section `"tframe methods"` below for some methods which should be supported. In particular, `start()`, `end()`, and `periods()` should be supported methods for any object of class `tframe`. (and until I make a lot of changes in my code, frequency is important.)





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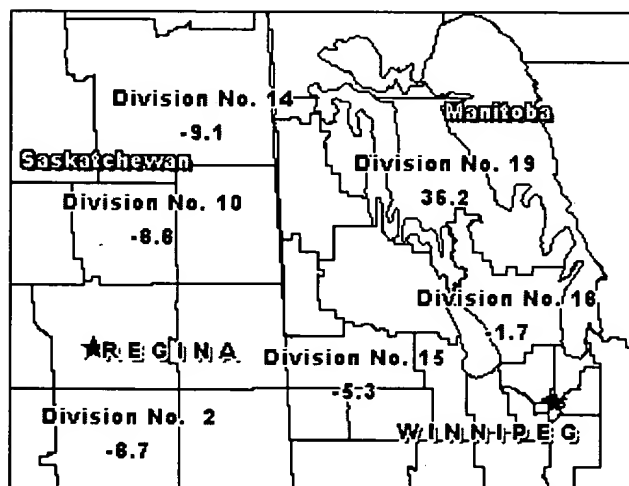
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As attributes, labels are **dynamically** connected to their map objects. If the layer is closed or is made invisible, the labels no longer display. If the data or geographic information changes, the labels change. If you create an expression for your labels and change the expression, the current labels are dynamically replaced with new ones.

Whether you label your map automatically, or interactively using the Label tool or the LabelAtPoint method, the content of the label is determined by the data associated with the geographic object.

In addition to label content, you control the position, display and look of automatic labels by using properties in the *LabelProperties object*. Set conditions for displaying labels, in what style they will display, and in what position for all the objects in the layer.



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